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ABSTRACT

Within the field of information science there is a significant difference between the citation patterns of journal articles and reports, in that both types of publication show a strong "same-channel" tendency; i.e., journal articles cite journal articles more than reports cite journal articles, and reports cite reports more than journal articles cite reports. The frequency of citation of the three less-used types of publication: books, proceedings, and theses are very similar, whether they are cited by journal articles or reports. No trend toward citation of a more informal precedent literature, such as personal communications and memoranda, was discernable. In the information science literature, 80% of the citations are less than five years old. Both journal articles and reports cite literature that, on the average, is less than two years old, indicating that reports and journal articles are equally up-to-date at the time of their publication. When the age distribution of the citations in journal articles is grouped by type of publication, the order of increasing age is: reports and proceedings (the same), journals, and books. In reports, cited reports, proceedings, and journal articles are of equal age, but cited books are older. (Author/NH)

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Citation Patterns in Information Science

A Thesis

Submitted to the Faculty

of

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by

Carol Jane Fenichel

in partial fulfillment of the

requirements for the degree

of

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GLOSSARY OF SPECIAL TERMINOLOGY USED IN THIS STUDY

JOURNAL SELF-CITATION ≡ JOURNAL ARTICLES CITING OTHER JOURNAL ARTICLES

REPORT SELF-CITATION≡ REPORTS CITING OTHER REPORTS

JOURNAL TITLE SELF-CITATION ≡ CITED JOURNAL ARTICLES PUBLISHED IN THE SAME JOURNAL AS THE CITING ARTICLE

INTRA-ORGANIZATIONAL CITATION ≡ CITING OF REPORTS ISSUED BY THE SAME INSTITUTION IN WHICH THE CITING AUTHOR(S) WORK (ED)

SAME-AUTHOR CITATION ≡ AN AUTHOR OF THE CITING PUBLICATION WAS ONE OF THE AUTHORS OF THE CITED PUBLICATION

THE ABOVE TERMINOLOGY LEADS TO ANALAGOUS CONCEPTS.

SAME-CHANNEL CITATION ≡ A. JOURNAL ARTICLE CITATION OF JOURNAL ARTICLES
B. REPORT CITATION OF REPORTS

INTER-CHANNEL CITATION ≡ A. JOURNAL ARTICLE CITATION OF REPORTS
B. REPORT CITATION OF JOURNAL ARTICLES

ABSTRACT

CITATION PATTERNS IN INFORMATION SCIENCE

AUTHOR: CAROL JANE FENICHEL

ADVISOR: MRS. CLAIRE K. SCHULTZ

IN THIS STUDY IT HAS BEEN FOUND THAT WITHIN THE FIELD OF INFORMATION SCIENCE THERE IS A SIGNIFICANT DIFFERENCE BETWEEN THE CITATION PATTERNS OF JOURNAL ARTICLES AND REPORTS, IN THAT BOTH TYPES OF PUBLICATION SHOW A STRONG "SAME-CHANNEL" TENDENCY, I.E. JOURNAL ARTICLES CITE JOURNAL ARTICLES MORE THAN REPORTS CITE JOURNAL ARTICLES, AND REPORTS CITE REPORTS MORE THAN JOURNAL ARTICLES CITE REPORTS. THE FREQUENCY OF CITATION OF THE THREE LESS-USED TYPES OF PUBLICATION: BOOKS, PROCEEDINGS, AND THESES ARE VERY SIMILAR, WHETHER THEY ARE CITED BY JOURNAL ARTICLES OR REPORTS. NO TREND TOWARD CITATION OF A MORE INFORMAL PRECEDENT LITERATURE, SUCH AS PERSONAL COMMUNICATIONS AND MEMORANDA, WAS DISCERNABLE.

THE INFORMATION SCIENCE LITERATURE, WITH 80% OF THE CITATIONS LESS THAN 5 YEARS OLD, IS ONE OF THE YOUNGEST REPORTED TO DATE. BOTH JOURNAL ARTICLES AND REPORTS CITE LITERATURE THAT ON THE AVERAGE IS LESS THAN TWO YEARS OLD, INDICATING THAT REPORTS AND JOURNAL ARTICLES ARE EQUALLY UP-TO-DATE AT THE TIME OF THEIR PUBLICATION. WHEN THE AGE DISTRIBUTION OF THE CITATIONS IN JOURNAL ARTICLES IS GROUPED BY TYPE OF PUBLICATION, THE ORDER OF INCREASING AGE IS:

REPORTS AND PROCEEDINGS (THE SAME), JOURNALS, AND BOOKS. IN REPORTS, CITED REPORTS, PROCEEDINGS, AND JOURNAL ARTICLES ARE OF EQUAL AGE, BUT CITED BOOKS ARE OLDER.

THE ORGANIZATIONS WHICH ISSUE INFORMATION SCIENCE REPORTS ARE MORE-OR-LESS EVENLY DISTRIBUTED AMONG THE FOUR SECTORS OF THE ECONOMY: BUSINESS, PRIVATE ORGANIZATIONS, UNIVERSITIES, AND THE FEDERAL GOVERNMENT.

OBJECTIVE

THE OBJECT OF THIS STUDY WAS TO COMPARE TECHNICAL REPORTS TO JOURNAL ARTICLES, AS CHANNELS OF COMMUNICATION IN INFORMATION SCIENCE. THE FOLLOWING NULL HYPOTHESES WERE TESTED: A) THE PERCENTAGE FREQUENCY OF CITATION OF JOURNAL ARTICLES IS NOT DIFFERENT IN JOURNAL ARTICLES AND REPORTS, AND B) THE PERCENTAGE FREQUENCY OF CITATION OF REPORTS IS NOT DIFFERENT IN JOURNAL ARTICLES AND REPORTS.

THE FREQUENCIES OF CITATION OF REPORTS, JOURNAL ARTICLES, BOOKS, PROCEEDINGS, ABSTRACTS OR BOOK REVIEWS, THESES, PERSONAL COMMUNICATIONS, AND NEWSPAPERS OR MAGAZINES WERE ESTABLISHED FOR THE SAMPLES EXAMINED. THE YEAR OF PUBLICATION OF EACH CITATION WAS DETERMINED SO THAT ELAPSED TIME BEFORE CITATION COULD ALSO BE STUDIED. THE INSTITUTIONAL ORIGIN OF CITED REPORTS WAS TABULATED TO SHOW THE DISTRIBUTION BY TYPE OF INSTITUTION AND TO IDENTIFY THE INSTITUTIONS ISSUING THE MAJORITY OF INFORMATION SCIENCE REPORTS. THE SAMPLE OR SOURCE PUBLICATIONS WAS DRAWN FROM THE ANNUAL REVIEW OF INFORMATION SCIENCE AND TECHNOLOGY, 1967.[1]

INTRODUCTION

THE IMPORTANCE OF TECHNICAL REPORTS AS A MEDIUM OF SCIENTIFIC COMMUNICATION HAS INCREASED RAPIDLY SINCE THE SECOND WORLD WAR; IT IS ESTIMATED THAT FROM 50,000 TO 150,000 REPORTS ARE ISSUED YEARLY IN THE UNITED STATES.[2,3] THE TECHNICAL REPORT HAS BEEN DEFINED AS A "FORM OF PUBLICATION WHICH IS CHARACTERIZED PRINCIPALLY BY ITS HETEROGENEITY OF STYLE, PROFESSIONAL STATURE, SIZE AND FORM OF REPRODUCTION AND BY THE ABSENCE OF ANYTHING LIKE VOLUME AND NUMBER RELATIONSHIPS".[4]

IN GENERAL, REPORTS DIFFER FROM JOURNAL ARTICLES IN THE FOLLOWING WAYS:

1. Reports are not formally refereed.

2. Primary distribution of journals is more widespread than that of reports.

3. Distribution of reports is sometimes restricted for proprietary or security reasons.

4. Reports have more pages than journal articles - fifty pages versus eight pages on the average,[5] partially because reports tend to appear in typescript while journal articles are printed. They are more nearly equal in number of words, reports still being longer.

5. Typically, reports contain more detailed descriptions of method and more data than journal articles.

6. The rate of obsolescence of reports has been shown to be greater than that of journal articles.[6,7,8]

7. Because they are not refereed or type-set, reports are generally believed to contain "newer" material than journal articles.

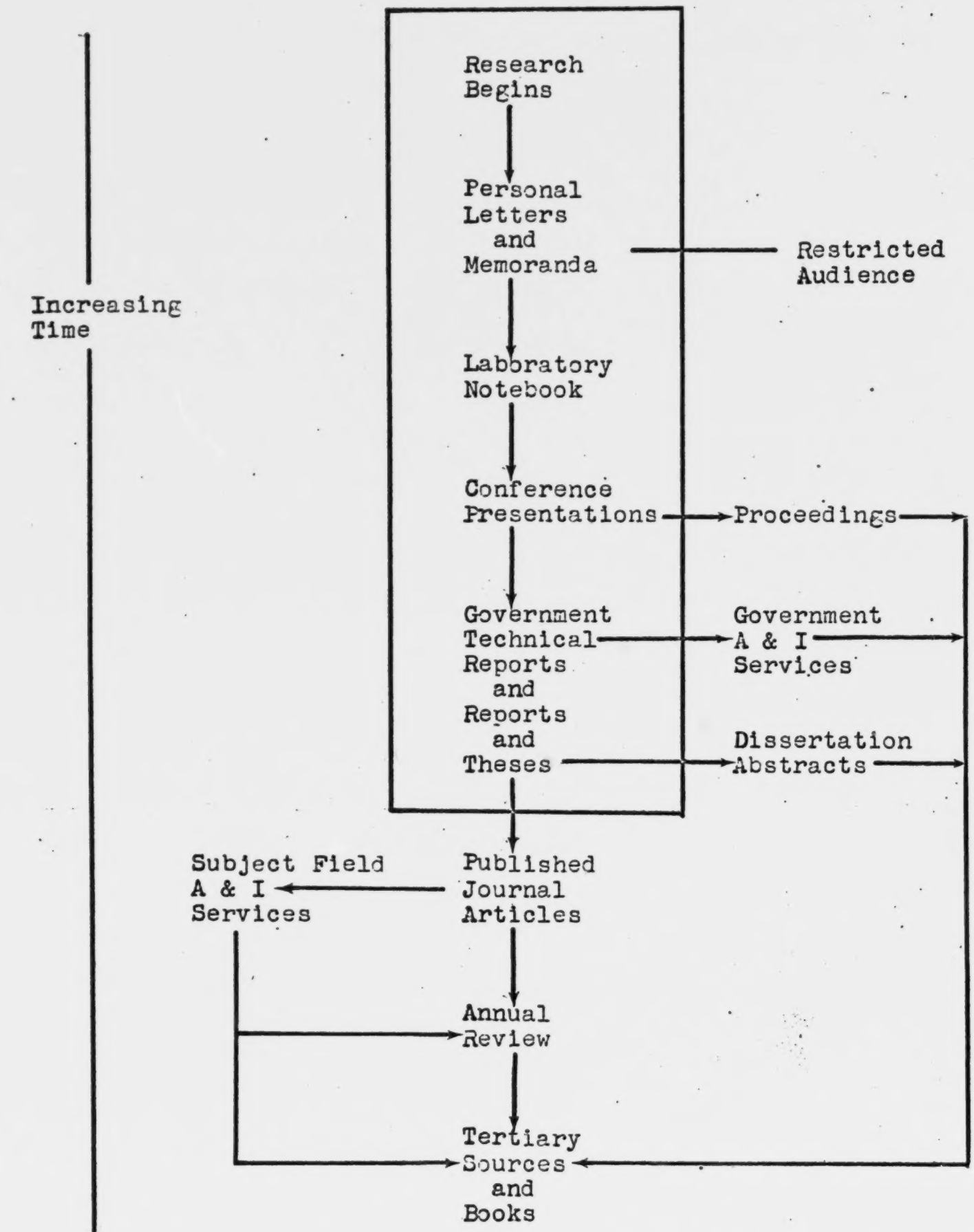
8. Reports are usually issued at irregular intervals.

A more complete comparison of reports and journal articles and how they function as publication channels is described by Orr and Leeds.[9]

One of the information models referred to frequently is that of the continuum from informal to formal communication. Figure 1 is an adaptation of the model as depicted by Garvey and Griffith for the communication network in psychology.[10] The model is not meant to imply that every message is presented sequentially in all the forms shown. That the subject-field secondary (bibliographic) services consider articles in published journals more important to index and abstract than reports,

Figure 1

Model of Written Communication: Information Continuum



IS SHOWN BY THEIR MORE SYSTEMATIC INCLUSION. SCOPE AND DEPTH OF COVERAGE OF REPORTS BY SECONDARY SERVICES VARIES GREATLY, AND FOR THE MOST PART SEEMS HAPHAZARD. THE THREE MAJOR ABSTRACTING AND INDEXING SERVICES IN INFORMATION SCIENCE, DOCUMENTATION ABSTRACTS, LIBRARY SCIENCE ABSTRACTS, AND LIBRARY LITERATURE, DEAL WITH REPORTS, BUT POLICIES CONCERNING BREADTH AND COMPLETENESS OF COVERAGE ARE UNSTATED. SCIENCE CITATION INDEX LISTS REPORTS IN THE CITATION INDEX BUT DOES NOT USE THEM FOR SOURCES.

IT CAN BE SEEN FROM FIGURE I THAT, EXCEPT FOR THE PARTIAL COVERAGE MENTIONED ABOVE, TECHNICAL REPORTS BECOME A PART OF THE ACCUMULATED BODY OF KNOWLEDGE IN A DIFFERENT WAY FROM THE PERIODICAL LITERATURE. THE MAJORITY OF TECHNICAL REPORTS RELATING TO INFORMATION SCIENCE ARE PRODUCED BY SCIENTISTS EMPLOYED BY THE FEDERAL GOVERNMENT OR BY SCIENTISTS WORKING IN PRIVATE INSTITUTIONS AND UNIVERSITIES UNDER GOVERNMENT CONTRACT. IN GENERAL, THESE SCIENTISTS SUBMIT PROGRESS REPORTS OR REPORTS OF COMPLETED RESEARCH (CALLED GOVERNMENT TECHNICAL REPORTS IN FIGURE I) TO THEIR GRANTING AGENCIES. THE REPORTS ARE THEN REVIEWED AND DISTRIBUTED ACCORDING TO STANDARD LISTS, AND SENT TO DEPOSITORIES OR DOCUMENT CENTERS DESIGNATED BY THE GRANTING AGENCIES. THE DOCUMENT CENTERS ISSUE THE GOVERNMENT ABSTRACTING AND INDEXING BULLETINS. NO CHECK WAS MADE TO DETERMINE WHAT PROPORTION OF GOVERNMENT REPORTS RELATING TO INFORMATION SCIENCE GO THROUGH THIS SYSTEM.

THE NUMBER OF REPORTS ON INFORMATION SCIENCE RESEARCH, NOT GOVERNMENT-SPONSORED, HAS NOT BEEN DETERMINED. THESE ARE BELIEVED TO BE A SMALL, THOUGH PERHAPS A SIGNIFICANT, PART OF THE TOTAL. MANY PRIVATELY-SPONSORED REPORTS CONTAIN PROPRIETARY INFORMATION AND HAVE VERY LIMITED

DISTRIBUTION. THE EXTENT TO WHICH NON-PROPRIETARY REPORTS ARE MADE AVAILABLE TO AUDIENCES OUTSIDE THE INSTITUTION OF ORIGIN IS NOT KNOWN.

THE MODEL SHOWN IN FIGURE 1 REFLECTS THE WIDELY-HELD BELIEF THAT REPORTS ARE AN EARLY STEP IN THE SCIENTIST'S ORGANIZATION OF HIS RESEARCH FINDINGS AND THAT THE MATERIAL IN THEM IS LATER CONDENSED AND PUBLISHED IN JOURNAL ARTICLES. HOWEVER, GRAY AND ROSENBORG[11] FOUND THAT OF THE 60 TO 65% OF UNCLASSIFIED REPORTS IN THE PHYSICAL SCIENCES WHICH CONTAINED PUBLISHABLE MATERIAL, ONLY HALF WERE PUBLISHED WITHIN TWO TO THREE YEARS, WITH A SMALLER PROPORTION PUBLISHED LATER. TALLMAN'S FINDINGS AND THOSE OF THE APA[2,12] ARE SIMILAR. HERNER[13] SHOWED THAT THE PROPORTION OF GOVERNMENT REPORTS EVENTUALLY PUBLISHED VARIED WITH THE FIELD, AND WAS MOST DEPENDENT ON THE ISSUING AGENCY, BECAUSE OF DIFFERENT STANDARDS AND POLICIES AMONG THE AGENCIES.

THE UTILIZATION OF VARIOUS TYPES OF PUBLICATIONS AS MEASURED BY CITATION COUNT HAS BEEN SHOWN TO DIFFER AMONG SCIENTIFIC FIELDS[14,15]; FOR EXAMPLE, IN PHYSICS JOURNALS IT WAS FOUND THAT ONLY 3% OF CITATIONS WERE TO TECHNICAL REPORTS[8], WHEREAS A STUDY OF SCIENTISTS WORKING FOR THE DEPARTMENT OF DEFENSE FOUND TECHNICAL REPORTS TO BE THE MOST FREQUENTLY-USED FORMAL COMMUNICATION CHANNEL, PROVIDING 16%[16] OF THE INFORMATION USED. VROOMAN[17] SHOWED THAT ALMOST 40% OF THE CITATIONS IN GOVERNMENT METALLURGICAL REPORTS WERE TO REPORTS.

PARKER[18*], PAISLEY, AND GARRET FOUND THAT IN AMERICAN DOCUMENTATION, THE JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE, MORE CITA-

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* FOR BREVITY, BECAUSE IT IS MENTIONED SO FREQUENTLY IN THE REMAINDER OF THE TEXT, REFERENCE 18 WILL BE REFERRED TO AS BEING AUTHORED BY PARKER.

TIONS DURING 1965 WERE TO REPORTS THAN TO ANY OTHER TYPE OF PUBLICATION. AMONG COMMUNICATIONS JOURNALS, THIS PREPONDERANCE OF REPORT CITATION WAS UNIQUE TO AMERICAN DOCUMENTATION. ASSUMING THAT REPORTS ARE CITED WHEN THE MATERIAL WARRANTS CITATION AND HAS NOT BEEN MORE FORMALLY PUBLISHED, ONE IS LED TO CONJECTURE THAT, IN THE FIELD OF INFORMATION SCIENCE, REPORT LITERATURE IS VERY IMPORTANT, AND THAT A LARGE PORTION OF RECORDED RESEARCH IS NOT PUBLISHED IN JOURNALS.

PARKER SAYS THAT "TO UNDERSTAND THE LARGER PATTERN OF CITATION AND TRANSFER OF IDEAS WE NEED TO KNOW WHAT SOURCES ARE CITED IN THE REPORTS THEMSELVES...IS THERE A CONTINUATION OF THE TREND TOWARD INFORMALITY, IN THIS CASE A CITATION OF MEMORANDA AND PERSONAL COMMUNICATIONS, OR DOES THE UNPUBLISHED REPORT CITE A FORMAL PRECEDENT LITERATURE AS IF IT WERE A NOT-YET-RECOGNIZED ADDITION TO THAT LITERATURE?" THIS STUDY WAS PARTLY AN ATTEMPT TO ANSWER THIS QUESTION POSED BY PARKER. THE PERCENTAGE FREQUENCIES OF CITATION TO DIFFERENT TYPES OF MATERIALS INCLUDING PERSONAL COMMUNICATIONS AND MEMORANDA, WERE DETERMINED AND COMPARED FOR JOURNAL ARTICLES AND REPORTS FROM THE FIELD OF INFORMATION SCIENCE. THE AGE PATTERNS OF THE CITATIONS IN THE TWO PUBLICATION FORMS WERE ESTABLISHED IN ORDER TO LEARN HOW REPORTS AND JOURNAL ARTICLES FUNCTION AS CHANNELS OF COMMUNICATION WITH RESPECT TO TIME.

RATIONALE AND ASSUMPTIONS

BIBLIOGRAPHIES WERE USED AS THE BASIS FOR THIS STUDY BECAUSE THE INVESTIGATOR CONSIDERS CITATIONS, BEING UNOBTRUSIVE MEASURES OF SCIENTIFIC COMMUNICATION, MORE RELIABLE MEASURES OF THE TYPE OF INFORMATION USE STUDIED THAN WOULD BE THE FINDINGS OF USER STUDIES BASED ON SUCH DATA-GATHERING DEVICES AS INTERVIEWS OR QUESTIONNAIRES. THE LATTER ARE MORE

SUBJECTIVE AND DEPENDENT UPON THE VAGARIES OF MEMORY.

IT HAS BEEN ASSUMED THAT CITATION PATTERNS DID NOT CHANGE BETWEEN 1965 AND 1967 SO THAT IT CAN BE CONSIDERED A SINGLE TIME PERIOD.

ONE METHOD OF ANALYSIS CHOSEN FOR THIS STUDY, DETERMINATION OF PERCENTAGE FREQUENCIES OF CITATION OF DIFFERENT TYPES OF PUBLICATIONS, IS SIMILAR TO PARKER'S; THEREFORE, THESE DATA CAN BE COMPARED.

METHOD

THE CITATIONS IN 70 JOURNAL ARTICLES WERE COMPARED TO THE CITATIONS IN 70 REPORTS. THE JOURNAL ARTICLES AND REPORTS FROM WHICH THE CITATIONS WERE TAKEN WERE SELECTED FROM BIBLIOGRAPHIES OF CHAPTERS APPEARING IN The Annual Review of Information Science and Technology, 1967. APPENDIX A LISTS THE CHAPTERS OF THE Annual Review AND GIVES FOR EACH THE NUMBER OF JOURNAL ARTICLES AND REPORTS SAMPLED FROM THE CHAPTER. THE SAMPLE CONSISTED OF JOURNAL ARTICLES AND REPORTS PUBLISHED WITHIN THE PERIOD 1965-67. THEY WERE CHOSEN IN THE FOLLOWING MANNER.

A FIRST SAMPLE OF 70 JOURNAL ARTICLES WAS TAKEN BY MAKING A RANDOM START AND SELECTING ALTERNATELY EVERY EIGHTH AND NINTH REFERENCE FROM THE TOTAL OF 616 JOURNAL ARTICLE CITATIONS IN THE Annual Review. EXCLUDED WERE: LETTERS, ABSTRACTS, BRIEF COMMUNICATIONS, OR ANY ARTICLES IN "NEWSY" PUBLICATIONS SUCH AS Science Information Notes, Library of Congress Bulletin, AND Newsletter of the ADI. OF THE 70 POTENTIAL SOURCE ARTICLES, 28 (40%) CONTAINED NO BIBLIOGRAPHIES AND ONE ARTICLE HAD TO BE ELIMINATED. THIS LEFT 41 ARTICLES WITH BIBLIOGRAPHIES, TOO FEW FOR MEANINGFUL STATISTICAL ANALYSIS. A SUPPLEMENTARY SAMPLE OF 50 JOURNAL ARTICLES WAS CHOSEN, USING RANDOM NUMBERS FROM A PUBLISHED TABLE. OF THESE, 20 ARTICLES (AGAIN 40%), CONTAINED NO BIBLIOGRAPHIES AND 3

ARTICLES HAD TO BE ELIMINATED. THE 27 ARTICLES ADDED TO THE 41 FROM THE FIRST SAMPLE GAVE 68 USABLE ARTICLES. A SECOND SUPPLEMENTARY SAMPLE OF 5 ARTICLES YIELDED TWO MORE ARTICLES WITH BIBLIOGRAPHIES, TO COMPLETE THE REQUIRED SAMPLE OF 70. TABLE I SUMMARIZES THE SAMPLING.

TOTAL JOURNAL ARTICLES EXAMINED:	125
NUMBER WITH CITATIONS (SAMPLE):	70
NUMBER WITHOUT CITATIONS:	51
NUMBER ELIMINATED:	4*

SUMMARY OF JOURNAL ARTICLE SAMPLING

TABLE I

ELEVEN OF THE SAMPLE JOURNAL ARTICLES WERE PUBLISHED IN 1965, 56 IN 1966, AND 3 IN 1967. FOUR JOURNAL TITLES PRODUCED FIVE OR MORE ARTICLES OF THE SAMPLE. THREE OF THESE, AMERICAN DOCUMENTATION, THE JOURNAL OF DOCUMENTATION, AND THE JOURNAL OF CHEMICAL DOCUMENTATION, ARE AMONG THE TOP TEN JOURNAL TITLES ESTABLISHED FOR THE FIELD OF DOCUMENTATION BY A CITATION STUDY[19]; THE FIRST TWO JOURNALS WERE AMONG THE 12 MOST FREQUENTLY CITED BY AMERICAN DOCUMENTATION IN 1965[18]. THE OMISSION OF THE JOURNAL OF CHEMICAL DOCUMENTATION FROM THE LATTER LIST IS SURPRISING, BECAUSE IT IS CITED MORE THAN ANY OTHER JOURNAL BY CONTRIBUTORS TO THE ANNUAL REVIEW. THE FOUR JOURNAL TITLES WHICH OCCURRED MOST OFTEN IN THE SAMPLE ARE LISTED IN TABLE 2; THE DISTRIBUTION OF THE REMAINDER OF THE SAMPLE ARTICLES IS GIVEN BY TYPE OF JOURNAL, RATHER THAN TITLE.

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* ONE CITATION WAS ELIMINATED BECAUSE IT WAS A LETTER, BUT NOT SO INDICATED IN THE ANNUAL REVIEW CITATION, AND SO WAS ERRONEOUSLY SELECTED AS A JOURNAL ARTICLE. THE OTHER THREE ARTICLES ELIMINATED WERE FROM THE FIRST SUPPLEMENTARY SAMPLE AND DUPLICATED ARTICLES IN THE FIRST SAMPLE OF 70; THIS HAPPENED BECAUSE A JOURNAL ARTICLE COULD BE CITED BY MORE THAN ONE ANNUAL REVIEW AUTHOR.

Journal Title or Type	No. of Articles
Journal of Chemical Documentation	13
American Documentation	6
Journal of Documentation	5
Special Libraries	5
Medical Journals (8)	11
Science Journals (6)	7
Library and Documentation Journals (5)	6
Technology Journals (4)	9
Psychology Journals (4)	4
Educational Journals (3)	4

Journal Title Distribution of Sample Journal Articles

Table 2

The 70 journal articles in the sample appeared in 34 different journal titles. Appendix B lists the articles which comprise the sample.

Report sampling paralleled the procedure for journal articles. The first 70 reports were chosen by taking every fifth report three times, and then the sixth, from the 366 reports cited in the Annual Review, again making a random start. Eligibility was decided according to the following guidelines.

A report was excluded from the sample if it was:

1. under 5 pages double-spaced in length.
2. a conference proceeding or any other record of oral presentation.
3. called an "Unpublished Report" in the Annual Review, or reported by the author to be "unpublished". These were a very small part of the total.
4. a manual, a guide, a directory, a bibliography or manufacturer's advertising literature.
5. a dissertation or thesis.

6. A WORK PUBLISHED IN EDITIONS.

7. ONE OF A REGULARLY-ISSUED SERIES.

8. LISTED IN BOOKS IN PRINT".

SOMETIMES BOTH A JOURNAL ARTICLE AND A REPORT WERE LISTED IN A SINGLE CITATION; WHEN THIS HAPPENED ONLY THE FIRST-LISTED PUBLICATION WAS CONSIDERED.

TWENTY-THREE (33%) OF THE FIRST SAMPLE OF REPORTS CONTAINED NO BIBLIOGRAPHIES, AND 5 OTHERS DID NOT FIT THE INCLUSION CRITERIA, LEAVING 42 USABLE. A SUPPLEMENTARY SAMPLE OF 50 WAS PICKED RANDOMLY. OF THESE 17 (34%) HAD NO BIBLIOGRAPHIES AND 5 WERE ELIMINATED. THIS LEFT 28 REPORTS WITH BIBLIOGRAPHIES, ENOUGH TO COMPLETE THE REQUIRED 70. TABLE 3 SUMMARIZES THE SAMPLING OF REPORTS.

TOTAL REPORTS EXAMINED:	120
NUMBER WITH CITATIONS (SAMPLE):	70
NUMBER WITHOUT CITATIONS:	40
NUMBER ELIMINATED:	10*

SUMMARY OF REPORT SAMPLING

TABLE 3

THE DISTRIBUTION OF REPORTS BY DATE WAS SIMILAR TO THAT OF JOURNAL ARTICLES; 18 WERE PUBLISHED IN 1965, 50 IN 1966, AND 2 IN 1967.

ONE OF THE MOST CHALLENGING PROBLEMS DURING THIS PROJECT WAS OBTAINING COPIES OF THE 120 REPORTS NEEDED WITHOUT UNDUE COST TO A STUDENT -

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*ONE CITATION WAS A DUPLICATE. THE OTHER NINE WERE INCORRECTLY IDENTIFIED BECAUSE OF LACK OF CLARITY AND COMPLETENESS IN THE ANNUAL REVIEW CITATIONS. ONE EACH WAS TO A CONFERENCE, A MASTER'S THESIS, AND A JOURNAL ARTICLE. TWO WERE TO BOOKS; TWO WERE NEVER "PUBLISHED" AND TWO OTHERS WERE LESS THAN 5 PAGES.

THE INVESTIGATOR. THIRTY-SIX WERE AVAILABLE IN NEARBY LIBRARIES; 29 OF THE REMAINDER HAD AD NUMBERS;* LETTERS SENT TO 31 INDIVIDUALS REQUESTING THE OTHER REPORTS PRODUCED ALL BUT 8; THE REMAINING 8 WERE OBTAINED FROM THE INFORMATION SCIENCE LITERATURE DISPLAY.**

THE CATEGORIES USED TO ANALYZE THE SAMPLE WERE: JOURNALS, REPORTS, BOOKS, CONFERENCES, PROCEEDINGS, ABSTRACTS OR BOOK REVIEWS, DISSERTATIONS OR THESES, PERSONAL COMMUNICATIONS OR MEMORANDA, NEWSPAPERS OR MAGAZINES, AND MISCELLANEOUS PUBLICATIONS.*** FOR EACH CITATION A RECORD WAS MADE OF THE TYPE OF PUBLICATION CITED AND THE DATE. WHEN EXAMINING A BIBLIOGRAPHY IN A JOURNAL ARTICLE OR REPORT, IT WAS NOT ALWAYS EASY TO CLASSIFY A CITATION ACCORDING TO ITS FORM OF PUBLICATION, TO ACERTAIN ITS DATE, OR EVEN TO DETERMINE THE TOTAL NUMBER OF CITATIONS IN AN ARTICLE. FOR THE SAKE OF CONSISTENCY, THE FOLLOWING GUIDELINES WERE USED.

1. COUNT REGULARLY ISSUED "NEWSY" PUBLICATIONS AS JOURNALS.
2. COUNT LETTERS PUBLISHED IN JOURNALS AS JOURNAL ARTICLES.
3. TABULATE "IBIDS" AS THE CITATION REFERRED TO; THUS ONE CITATION IN A BIBLIOGRAPHY CAN BE TABULATED TWO OR MORE TIMES.

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* COPIES OF THE BIBLIOGRAPHIES OF THESE REPORTS WERE SENT WITHOUT CHARGE BY MR. GREGORY ABDIAN OF THE DEFENSE DOCUMENTATION CENTER.

** THE LITERATURE DISPLAY, PREPARED BY THE NEW YORK CHAPTER OF ASIS, CONTAINS 85% OF THE DOCUMENTS CITED IN THE 1967 ANNUAL REVIEW. MRS. JOYCE A. MANN, CURATOR OF THE DISPLAY, LOCATED AT THE UNIVERSITY OF MARYLAND, PROVIDED COPIES OF THE BIBLIOGRAPHIES REQUESTED AS A SPECIAL FAVOR.

*** AS FAR AS CAN BE ASCERTAINED THESE CATEGORIES ARE CLOSELY COMPARABLE TO PARKER'S. HE CALLS REPORTS "UNPUBLISHED REPORTS" AND DISTINGUISHES BETWEEN PUBLISHED AND UNPUBLISHED CONVENTION PROCEEDINGS; IN THIS STUDY ALL KINDS OF PROCEEDINGS AND CONFERENCES HAVE BEEN GROUPED TOGETHER. ALSO, PARKER COUNTED CITED MATERIAL ONLY ONCE PER ARTICLE (DIFFERENT FROM GUIDELINE 3).

4. Count directories, thesauri, handbooks and similar materials as "Miscellaneous".

5. If two or more citations are placed together as if referring to the same idea - usually under one number - tabulate each of them separately.

6. If a date range is given in the citation, take the last date.

7. Tabulate citations in footnote form as though they were listed in the bibliography.

8. Use the date given in the citation. (For instance, citations of the International Conference on Scientific Information (ICSI) were recorded as 1958, the year of the conference, or 1959, the year of publication of the proceedings, depending upon which date was given.)

9. If the citation lists two issuing agencies, count both.

A record was kept of all institutions issuing reports, recorded from both the citing and cited report.

RESULTS

A. Citation distribution according to type of publication

The total number of citations in the 70 journal articles sampled was 962, an average of 14 per source article. The range in number of citations was 1-88. Considering both the sample articles and the articles without citations (see Table 1), the average number of citations per article was 8, the same as the median of 8 citations per article found by Parker for American Documentation in 1965, but lower than the average of 13.7 citations per article calculated for science literature in general.[20]

THE 70 REPORTS CONTAINED 3273 CITATIONS, AN AVERAGE OF 47 PER REPORT, WITH A RANGE OF 1-660. FIVE OF THE REPORTS (NOS. 17, 32, 57, 62, AND 70) WERE LITERATURE REVIEWS AND HAD VERY LARGE BIBLIOGRAPHIES WHICH CONTAINED 1829 CITATIONS, OVER HALF OF THE TOTAL. WITH THESE REPORTS EXCLUDED, THE AVERAGE NUMBER OF CITATIONS PER REPORT WAS 22.

THE HYPOTHESES OF NO DIFFERENCE IN CITATION DISTRIBUTION ACCORDING TO THE TWO DIFFERENT PUBLICATION FORMS, REPORTS AND JOURNAL ARTICLES, WAS TESTED. THE PERTINENT DATA ARE GIVEN IN TABLE 4. CITATIONS TO ABSTRACTS, BOOK REVIEWS, NEWSPAPER AND MAGAZINES WERE SO FEW THAT THEY HAVE BEEN PUT INTO THE "MISCELLANEOUS" CATEGORY.

Type of Publication Cited	Distribution of Citations in Journal Articles %	Distribution of Citations in Reports %
Journal Articles	47.3	21.9
Reports	22.7	37.8
Books and Book Chapters	13.5	15.7
Proceedings and Conferences	11.3	12.2
Dissertations and Theses	0.1	3.8
Personal Communications and Memoranda	1.1	1.3
Miscellaneous	3.7	7.2

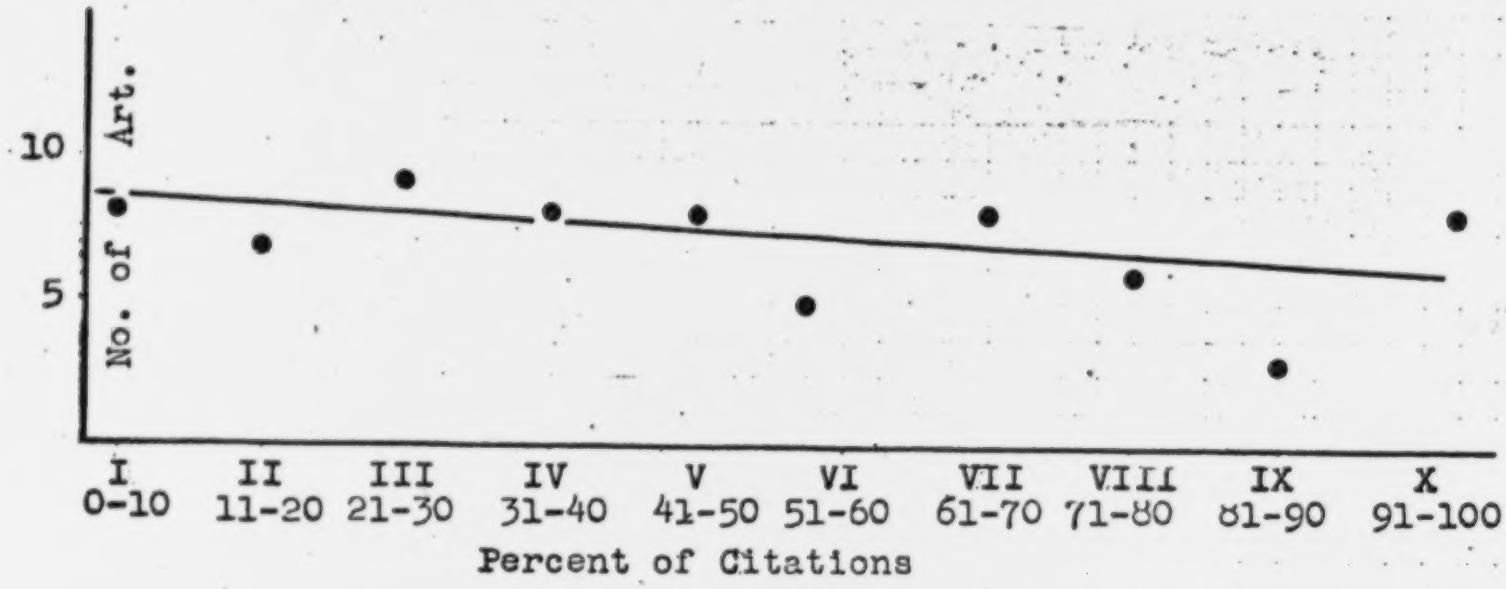
Distribution of Citations
In Reports and Journal Articles

Table 4

THE DIFFERENCE BETWEEN THE PERCENTAGE OF JOURNAL ARTICLE CITATIONS IN JOURNAL ARTICLES AND IN REPORTS WAS TESTED FOR SIGNIFICANCE; LIKEWISE THE PERCENTAGE OF REPORT CITATIONS IN JOURNAL ARTICLES AND IN REPORTS. IN ORDER TO DETERMINE THE DISTRIBUTION, AND FROM THAT THE APPROPRIATE STATISTICAL TEST TO USE, THE FREQUENCY DISTRIBUTIONS SHOWN IN FIGURES 2 AND 3 WERE PREPARED. FROM THESE AN ASSUMPTION OF

Figure 2

Frequency Distribution of Citations of
Journal Articles by Journal Articles



Frequency Distribution of Citations of
Reports by Journal Articles

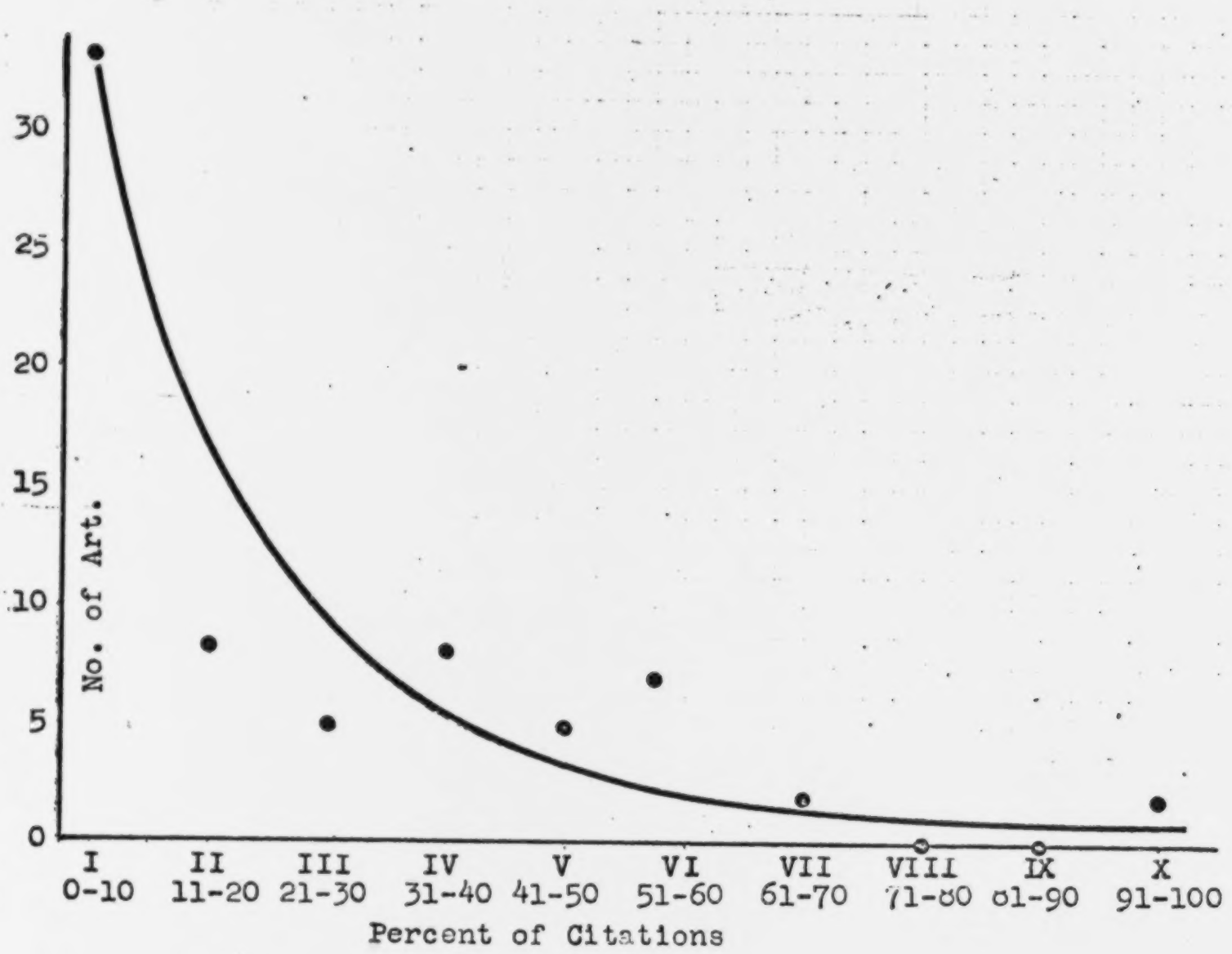
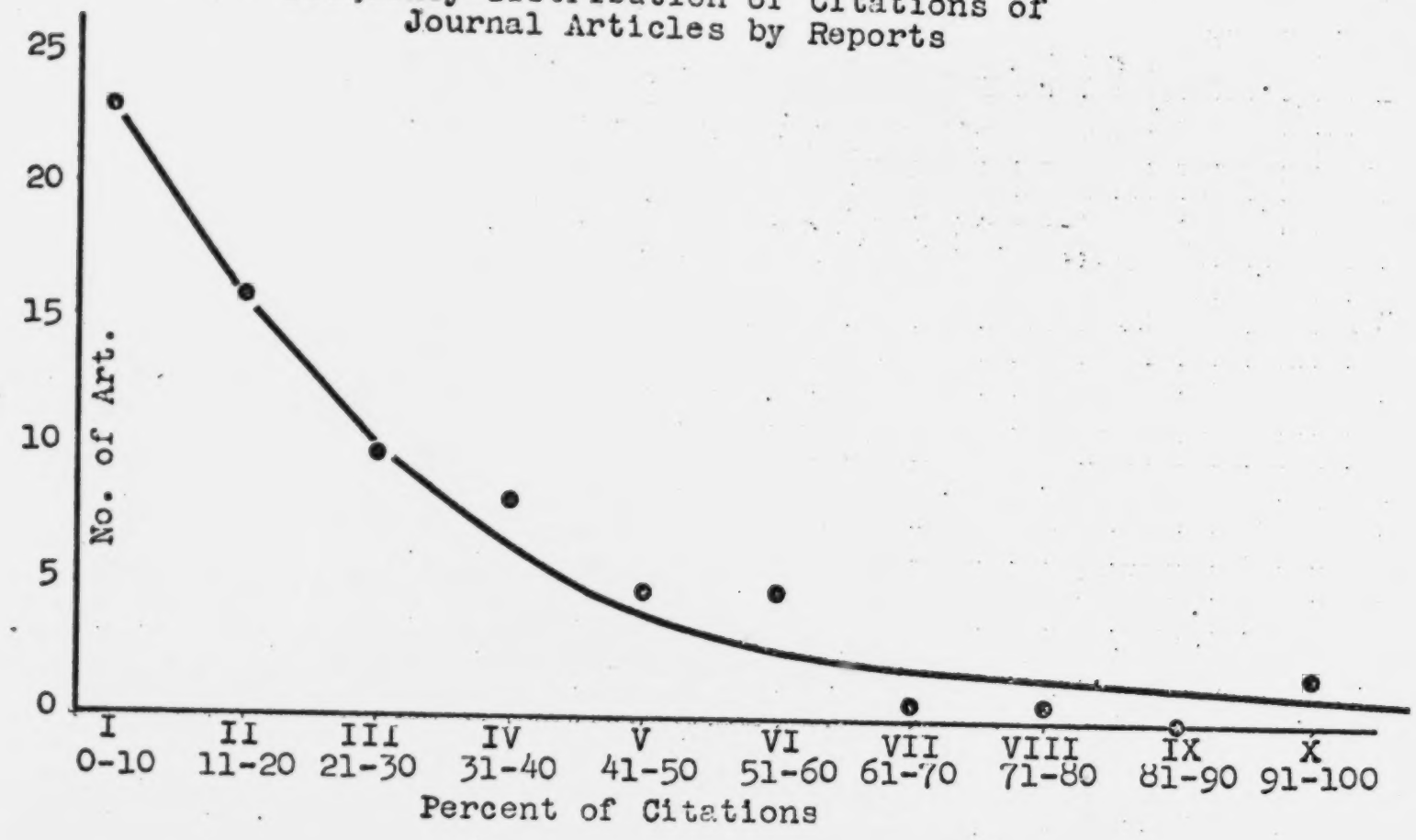
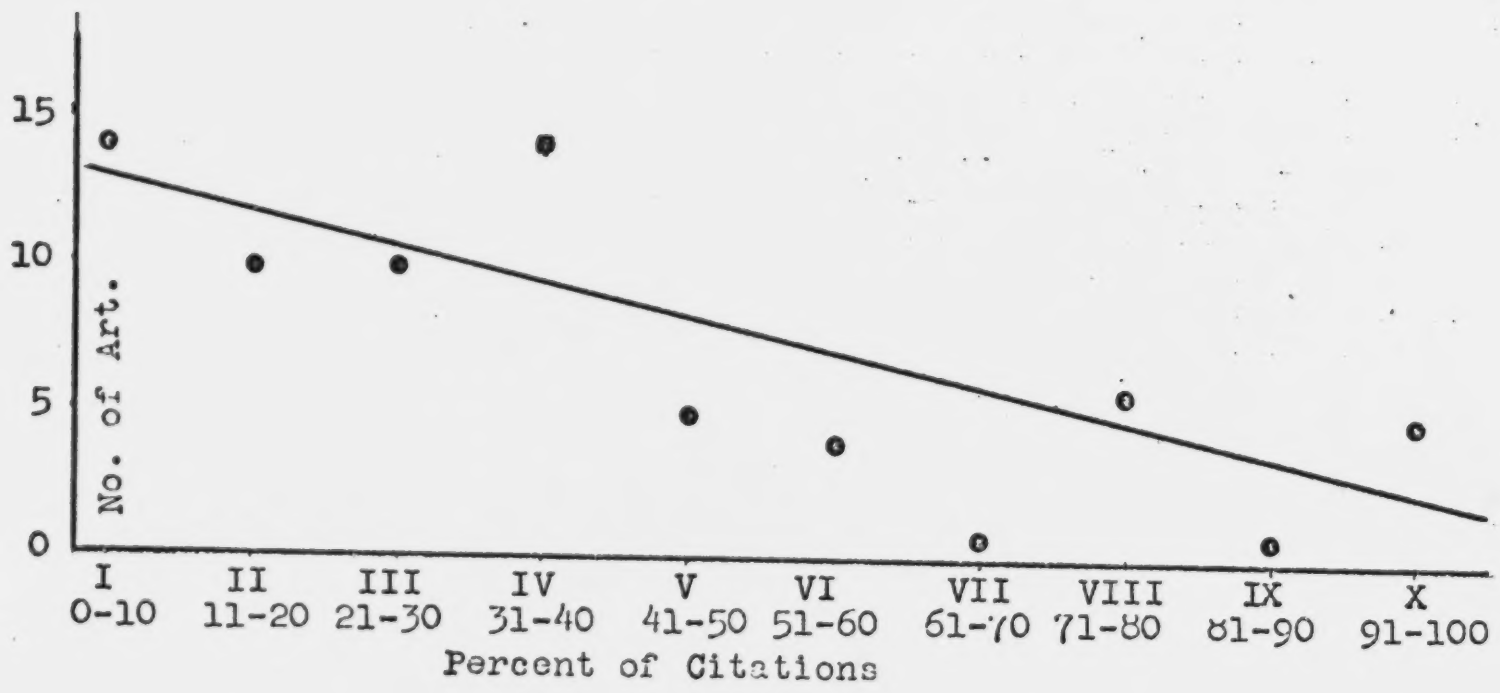


Figure 3
Frequency Distribution of Citations of
Journal Articles by Reports



Frequency Distribution of Citations of
Reports by Reports



NORMALITY WAS MADE AND A T-TEST WAS USED BECAUSE THE SAMPLE SIZE WAS SMALL AND THE DISTRIBUTION CURVES DID NOT INDICATE A MORE SOPHISTICATED PROCEDURE. BOTH OF THE DIFFERENCES WERE SIGNIFICANT AT THE 0.05 LEVEL. BECAUSE THE FIVE LARGE REPORTS, WHICH WILL BE CALLED REVIEW REPORTS, DIFFERED SO MUCH FROM THE SAMPLE AVERAGE IN ONE ASPECT, SIZE OF BIBLIOGRAPHY, IT WAS FELT THAT THESE FEW REPORTS MIGHT HAVE SKEWED THE RESULTS. THE AVERAGE PERCENTAGE CITATION OF JOURNAL ARTICLES FOR THE LARGE REPORTS CONSIDERED SEPARATELY WAS 35.5 COMPARED TO 21.9% FOR THE SAMPLE AS A WHOLE. REMOVING THE REVIEW REPORTS FROM THE SIGNIFICANCE CALCULATION WOULD MAKE THE AVERAGE PERCENT LOWER, AND THUS, ENHANCE THE RESULTS BY MAKING THE DIFFERENCE MORE SIGNIFICANT. THE AVERAGE PERCENTAGE CITATION OF REPORTS IN THE REVIEW REPORTS WAS CALCULATED TO BE 36.0; LITTLE DIFFERENT FROM THE TOTAL SAMPLE AVERAGE OF 37.8%. THE SMALL DIFFERENCE WOULD NOT AFFECT THE SIGNIFICANCE TEST.

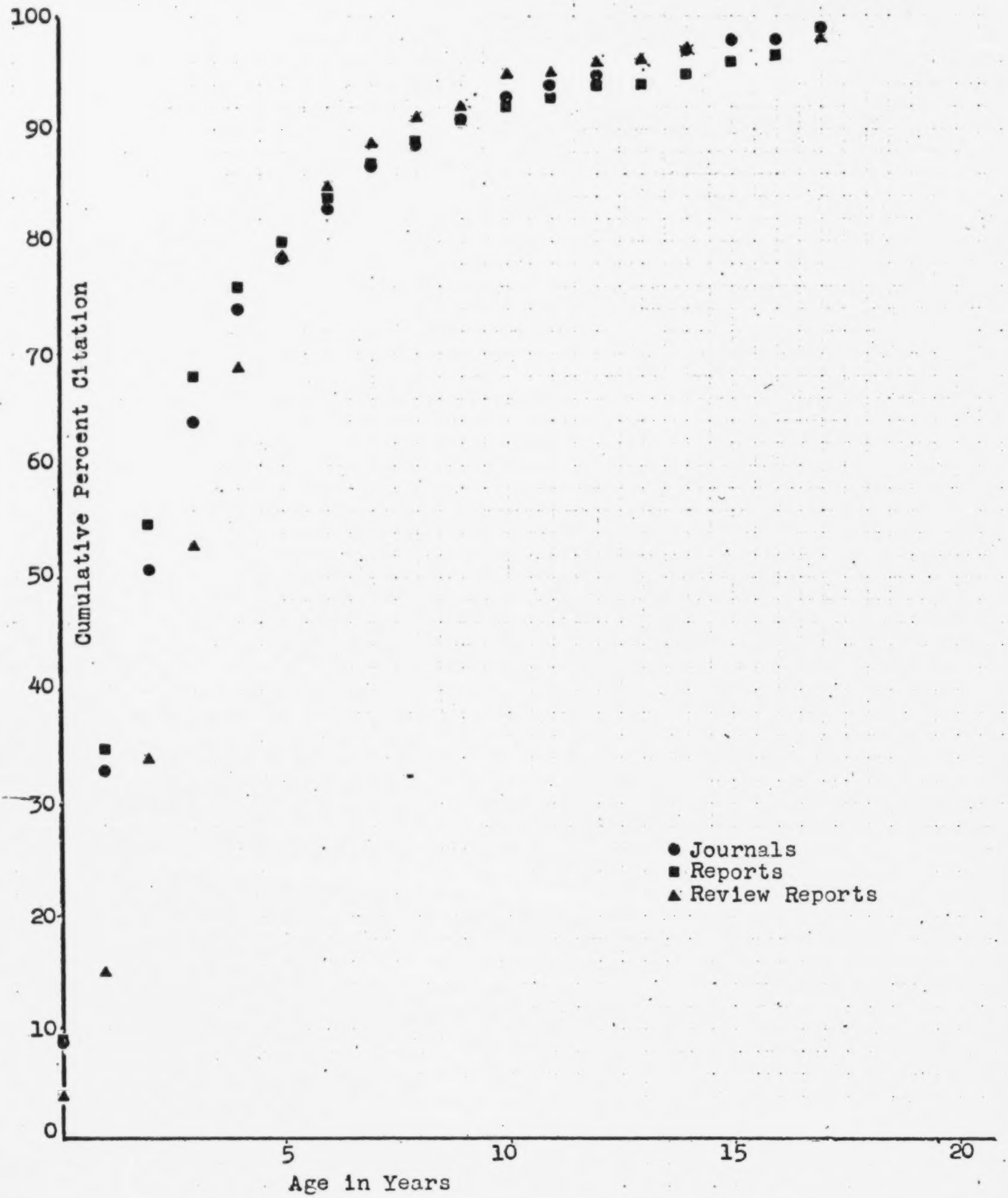
B. AGE PATTERNS OF CITATIONS

THE DATES OF ALL CITATIONS WERE RECORDED, WITH THE EXCEPTION OF THE REVIEW REPORTS FOR WHICH ONLY THE FIRST 200 REFERENCES WERE USED. THE RANGE IN AGE OF CITATIONS IN JOURNAL ARTICLES WAS 0-64 YEARS; IN REPORTS 0-110 YEARS.

THE TOTAL NUMBER OF CITATIONS ACCORDING TO AGE WAS CALCULATED SEPARATELY FOR SOURCE JOURNAL ARTICLES, SOURCE REPORTS, AND THE FIVE REVIEW REPORTS. THE NUMBER OF CITATIONS OF EACH AGE WAS CONVERTED TO PERCENTAGES TO NORMALIZE THE DATA. FIGURE 4 IS A PLOT OF AGE AGAINST THE CUMULATIVE PERCENTAGE CITATION. IT CAN BE SEEN THAT WITHIN THE LIMITS OF EXPERIMENTAL ERROR THE CURVES FOR REPORTS AND JOURNAL ARTICLES ARE THE SAME. THE CURVE FOR THE FIVE REVIEW REPORTS, HOWEVER, IS DIFFERENT,

Figure 4

Comparison of Age of Citations in Reports, Journals, Review Reports



AND FOR THIS REASON THE REVIEW REPORTS HAVE BEEN EXCLUDED FROM THE REMAINDER OF THE AGE CALCULATIONS.

THE DATA GIVEN IN FIGURE 4 ARE TYPICAL OF AGE CURVES FOR CITATIONS, THAT IS, HEAVY CITING OF RECENT WORKS, FOLLOWED BY A RAPID DROP, WITH GRADUAL TAPERING TO A VERY LOW LEVEL LATER ON. FOR BOTH JOURNALS AND REPORTS THE MOST FREQUENT CITATION AGE WAS 1 YEAR WITH 24% AND 26% RESPECTIVELY. NOT UNEXPECTEDLY, THE REVIEW REPORTS HAVE AN OLDER CURVE WITH THE AGE OF HIGHEST CITATION AT 3 YEARS.

THE AGE OF CITATIONS IN JOURNAL ARTICLES AND REPORTS, ACCORDING TO TYPE OF PUBLICATION CITED, WAS ALSO CALCULATED BY YEAR AS SHOWN IN FIGURES 5 AND 6. FOR JOURNALS THE INCREASING AGE-ORDER IS: REPORTS AND PROCEEDINGS (THE SAME), JOURNAL ARTICLES, AND BOOKS. IN REPORTS, THE JOURNAL ARTICLES AND REPORTS CITED ARE NEARLY THE SAME AGE. THE CURVE FOR PROCEEDINGS OF MEETINGS IS NOTEWORTHY; THE ABRUPT CHANGE AT 7 YEARS IS ALMOST CERTAINLY DUE TO ICSI,* THE PROCEEDINGS OF WHICH WERE PUBLISHED IN 1959, 7 YEARS BEFORE THE YEAR OF PUBLICATION OF THE MAJORITY OF THE REPORTS - 1966. APPARENTLY, ICSI HAS HAD AN IMPORTANT INFLUENCE ON THE FIELD.

C. INSTITUTIONS ISSUING INFORMATION SCIENCE REPORTS

APPENDIX D LISTS THE INSTITUTIONS WHICH WERE CITED MORE FREQUENTLY AS SOURCES OF REPORTS. THE TOTAL NUMBER OF INSTITUTIONS (INCLUDING THE "MISCELLANEOUS AND UNIDENTIFIABLE" CATEGORY) IS 222, WITH LESS THAN ONE-THIRD OF THEM CITED MORE THAN 5 TIMES. THE INSTITUTIONS CAN BE CLASSIFIED

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* THE INTERNATIONAL CONFERENCE ON SCIENTIFIC INFORMATION, WASHINGTON, D.C. NOV. 16-21, 1958. PROCEEDINGS PUBLISHED BY THE NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL, WASHINGTON, D.C., 1959.

Figure 5

Age of Citations in Journals According to Type of Publication

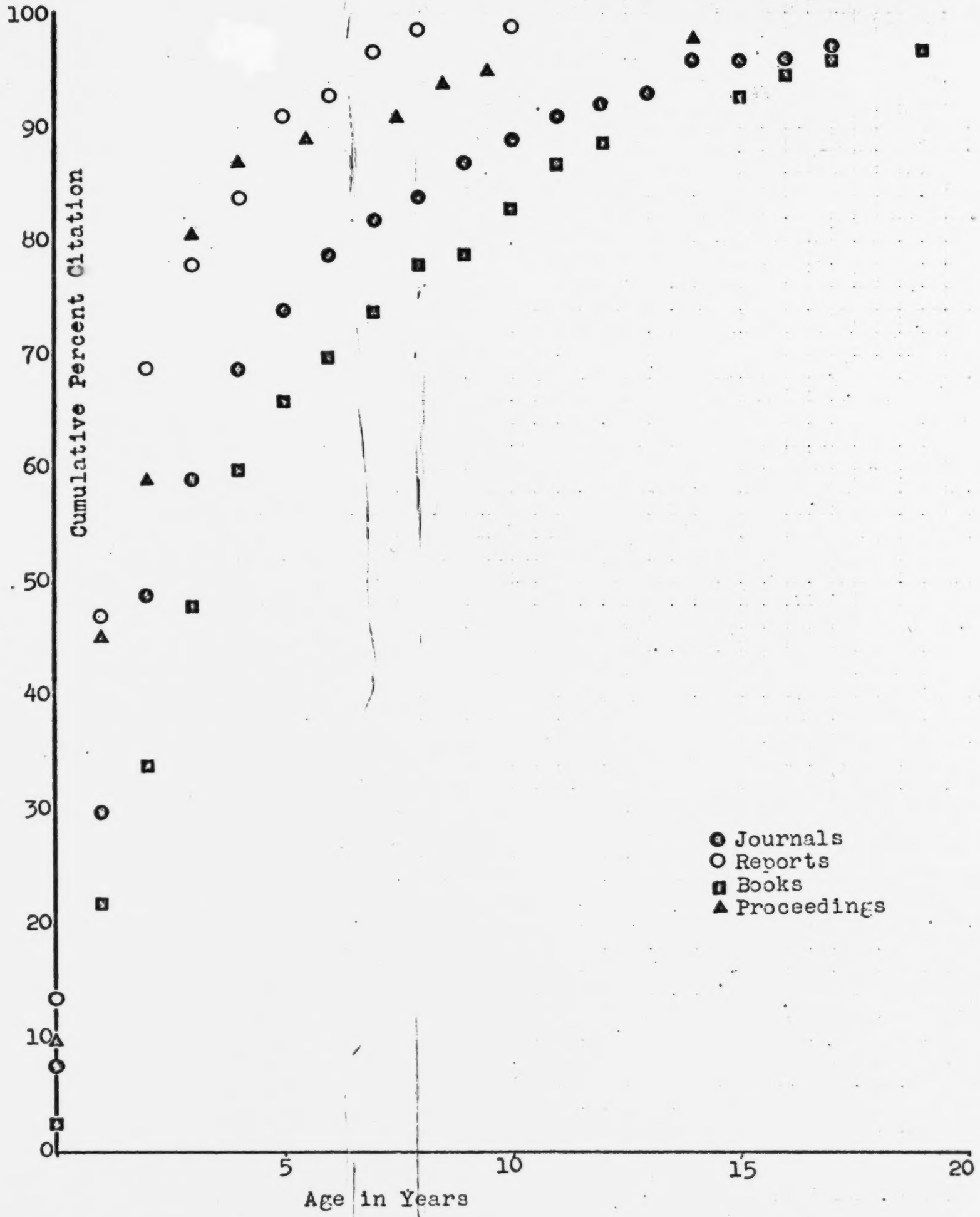
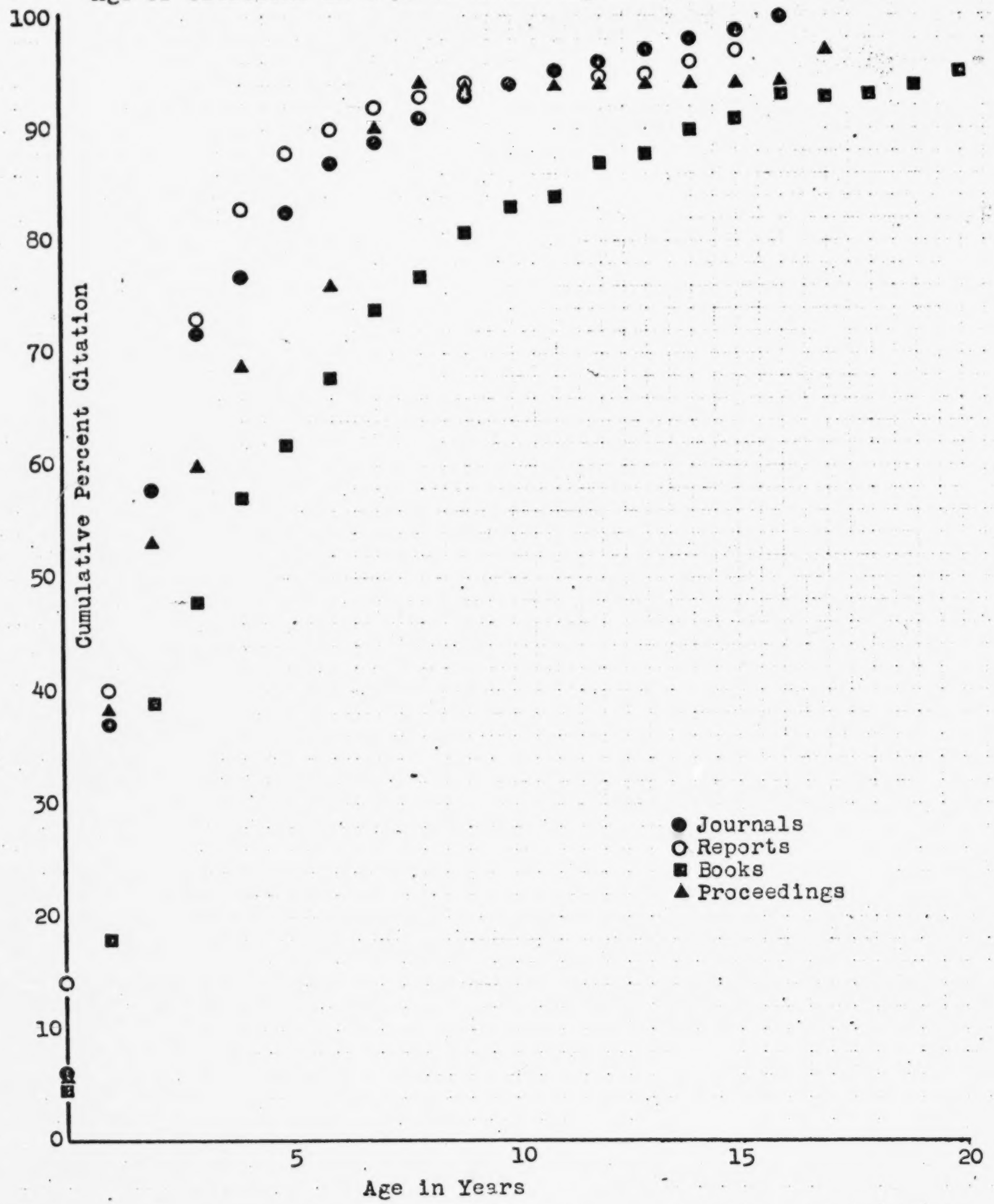


Figure 6

Age of Citations in Reports According to Type of Publication



INTO THE FOUR TYPES GIVEN IN TABLE 5.

TYPE OF INSTITUTION	NO. OF INSTITUTIONS ISSUING I. S. REPORTS
BUSINESS	61
PRIVATE INSTITUTIONS AND ASSOCIATIONS	57
UNIVERSITIES	45
FEDERAL GOVERNMENT	47

TYPE OF INSTITUTIONS
ISSUING INFORMATION SCIENCE REPORTS

TABLE 5

TABLE 5 SHOWS THAT THE INSTITUTIONS ARE MORE-OR-LESS EVENLY DIVIDED AMONG THE FOUR SECTORS OF THE ECONOMY. RELATIVELY FEW INSTITUTIONS WERE CITED VERY FREQUENTLY AS REPORT SOURCES. IBM STOOD FAR ABOVE THE OTHERS WITH 108 CITATIONS; SYSTEM DEVELOPMENT CORPORATION, THE UNIVERSITY OF ILLINOIS, MIT, STANFORD, HARVARD, AND THE ROME AIR DEVELOPMENT CENTER OF THE U. S. AIR FORCE WERE OTHER OUTSTANDING INSTITUTIONAL SOURCES OF REPORTS.

DISCUSSION

IT CAN BE SEEN FROM TABLE 4 THAT THE MAJOR PERCENTAGE OF CITATIONS IN REPORTS, AS WELL AS IN JOURNAL ARTICLES, IS TO JOURNAL ARTICLES, REPORTS, BOOKS AND PROCEEDINGS. THERE IS NO EVIDENCE, IN REPLY TO THE QUESTION RAISED BY PARKER, THAT REPORTS ARE BASED ON A LESS FORMAL PRECEDENT LITERATURE. ONLY ONE PERCENT OF THE CITATIONS IN BOTH THE JOURNAL ARTICLES AND REPORTS WERE TO PERSONAL COMMUNICATIONS OR MEMORANDA.

HOWEVER, THE RESULTS SHOW THAT JOURNAL ARTICLES IN INFORMATION SCIENCE CITE JOURNAL ARTICLES MORE THAN REPORTS CITE JOURNAL ARTICLES, AND REPORTS CITE REPORTS MORE THAN JOURNAL ARTICLES CITE REPORTS.

THE DIFFERENCES ARE SIGNIFICANT. PARKER FOUND THAT IN AMERICAN DOCUMENTATION IN 1965, REPORTS WERE CITED MORE FREQUENTLY THAN JOURNAL ARTICLES. TABLE 6 COMPARES PARKER'S RESULTS WITH THE RESULTS OF THIS STUDY.

TYPE OF PUBLICATION CITED	PERCENT OF CITATIONS WITHIN AD (1965)*	PERCENT OF CITATIONS WITHIN JOURNALS SAMPLED*
JOURNAL ARTICLES	25.4	47.3
REPORTS	31.0	22.7
BOOKS AND BOOK CHAPTERS	15.8	13.5
PROCEEDINGS AND CONFERENCES	11.8	11.3
THESES AND DISSERTATIONS	1.4	0.1
PERSONAL COMMUNICATIONS & MEMORANDA	0.8	1.1
MISCELLANEOUS AND OTHER	13.6	3.7

DISTRIBUTION OF CITATIONS IN JOURNAL ARTICLES

TABLE 6

THIS DIFFERENCE ILLUSTRATES THE IMPORTANCE OF DEFINITIONS AND OF SAMPLE POPULATION, SINCE PERIODICAL LITERATURE OF THE INFORMATION SCIENCE FIELD DEFINED AS THE ARTICLES IN AMERICAN DOCUMENTATION SHOWED ONE PATTERN, THE LITERATURE DEFINED AS THE ARTICLES IN THE ANNUAL REVIEW, ANOTHER. HOWEVER, THE CITATION PERCENTAGES TO THE FOUR LESS-USED TYPES OF PUBLICATION, THAT IS, BOOKS, PROCEEDINGS, THESES, AND PERSONAL COMMUNICATIONS, ARE VERY SIMILAR FOR THE JOURNAL ARTICLES AND REPORTS SAMPLED FOR THIS STUDY COMPARED WITH THOSE ANALYZED BY PARKER. THE CITATION PATTERNS FOUND IN THIS STUDY ARE ALSO QUITE DIFFERENT FROM THOSE FOUND BY PARKER FOR COMMUNICATIONS JOURNALS, IN WHICH BOOKS AND JOURNALS ARE VERY HEAVILY CITED AND CITATION TO NO OTHER SOURCE IS GREATER THAN 8%.

THE CITATION PATTERN FOUND IN THIS STUDY IS THE STRONG "SAME-CHANNEL" TENDENCY OF JOURNAL ARTICLES AND REPORTS; OTHER AUTHORS HAVE FOUND

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* SEE FOOTNOTE ON PAGE 11.

THAT JOURNALS CITE JOURNALS MORE THAN ANY OTHER PUBLICATION FORM.[14,18,20,21] THE PERCENTAGE OF JOURNAL SELF-CITATION VARIES WITH THE SUBJECT FIELD; THE NATURAL SCIENCES SEEM TO HAVE THE HIGHEST PERCENT OF JOURNAL SELF-CITATION (84%).[20] IN THE SOCIAL SCIENCES THIS "SAME CHANNEL" PATTERN IS LESS STRONG AND OTHER TYPES OF PUBLICATIONS, SUCH AS BOOKS, BECOME MORE IMPORTANT.[14] STUDIES IN THE PHYSICAL SCIENCES HAVE SHOWN REPORTS TO BE USED VERY LITTLE BY JOURNAL AUTHORS - 3%,[8] LESS THAN 10%,[17] AND 1.6%.[17]

BOTH THE FINDINGS OF VROOMAN'S[17] CITATION ANALYSIS OF METALLURGICAL REPORTS AND THE RESULT OF THIS STUDY SHOW THAT REPORTS ALSO HAVE THIS "SAME-CHANNEL" CITATION TENDENCY. THE PERCENTAGE OF SELF-CITATION BY REPORTS FOUND BY VROOMAN[17] (39.6%) IS ALMOST THE SAME AS REPORTED IN THIS PAPER FOR THE ANNUAL REVIEW SAMPLE (37.8%).

SEVERAL FACTORS COULD ACCOUNT FOR THE HEAVY SELF-CITATION PATTERN OF JOURNAL ARTICLES AND REPORTS. PERHAPS REPORT INFORMATION IS ACTUALLY MORE RELEVANT TO REPORTS AND JOURNAL ARTICLE INFORMATION IS MORE RELEVANT TO JOURNAL ARTICLES. ANOTHER POSSIBILITY IS THAT THE TWO TYPES OF PUBLICATIONS CONTAIN EQUALLY RELEVANT AND IMPORTANT INFORMATION BUT THAT THE COMMUNICATION CHANNELS ARE WORKING IN SUCH A WAY THAT REPORT AUTHORS ARE NOT BEING INFORMED OF JOURNAL MATERIAL AND VICE VERSA. PRIMARY DISTRIBUTION IS NOT THE SAME FOR REPORTS AND JOURNAL ARTICLES; FIGURE 1 SHOWS THAT THE SECONDARY COVERAGE IS ALSO DIFFERENT.

IT IS KNOWN THAT INFORMATION FLOWS THROUGH MANY CHANNELS BESIDES THOSE DEPICTED IN FIGURE 1. ONE PATH IN THE COMMUNICATION NETWORK IS FROM THE AUTHOR TO HIMSELF; AN AUTHOR OFTEN BASES A PUBLISHED WORK ON HIS OWN PREVIOUS RESEARCH. IN ORDER TO HAVE AN INDICATION OF THE EF-

FECT OF "SAME-AUTHOR" CITATION ON THE "SAME-CHANNEL" TENDENCY OF JOURNAL ARTICLES AND REPORTS, THE PERCENTAGE OF "SAME-AUTHOR" CITATION WAS CALCULATED FOR THE TWO SAMPLES, AND DIVIDED ACCORDING TO TYPE OF PUBLICATION. "SAME-AUTHOR" CITATION WAS DEFINED AS AN AUTHOR CITING A PUBLICATION OF WHICH HE WAS ALSO AN AUTHOR. FOR JOURNALS, THE PERCENTAGE OF "SAME-AUTHOR" CITATION WAS 15.7%, WITH 10.8% TO JOURNALS, AND 1.2% TO REPORTS. THE CORRESPONDING FIGURES WERE LOWER FOR REPORTS; 9.4% WITH 2.1% TO JOURNALS AND 4.0% TO REPORTS. IT APPEARS THAT "SAME-AUTHOR" CITATION IS A FACTOR CONTRIBUTING TO THE "SAME-CHANNEL" TENDENCY OF BOTH JOURNAL ARTICLES AND REPORTS.

ANOTHER PATHWAY EASILY DEFINABLE BY CITATION COUNT IS JOURNAL TITLE SELF-CITATION, CITING OTHER ARTICLES PUBLISHED IN THE SAME JOURNAL AS THE CITING ARTICLE. EXCEPT FOR CERTAIN INTER-DISCIPLINARY JOURNALS SUCH AS Science AND Nature, JOURNALS TEND TO SPECIALIZE IN A PARTICULAR SUBJECT MATTER. THUS, AUTHORS FREQUENTLY SCAN OR READ REGULARY THE JOURNALS IN WHICH THEY PUBLISH. TYPICALLY, ARTICLES WRITTEN IN A JOURNAL TITLE WILL CITE THE PARENT JOURNAL TITLE MORE THAN ANY OTHER JOURNAL.[18,19] THE AMOUNT OF JOURNAL TITLE SELF-CITATION FOR THE JOURNAL SAMPLE OF THIS STUDY WAS 14.2%; IT WOULD SEEM THAT JOURNAL TITLE SELF-CITATION IS ALSO HAVING AN EFFECT ON THE STRONG "SAME-CHANNEL" PATTERN OF THE JOURNAL ARTICLES.

AN INFORMAL PATHWAY WHICH MIGHT CONTRIBUTE TO THE "SAME-CHANNEL" CITATION WITHIN JOURNAL ARTICLES AND REPORTS IS "INTRA-ORGANIZATIONAL" CITATION. AUTHORS PROBABLY LEARN OF REPORTS ISSUED WITH THE ORGANIZATION IN WHICH THEY WORK THROUGH INTERNAL CHANNELS, NOT AVAILABLE TO THE PUBLIC; FREQUENTLY, SEVERAL RESEARCH PROJECTS IN AN ORGANIZATION

WILL CONSIST OF RELATED WORK. IN JOURNAL ARTICLES, "INTRA-ORGANIZATIONAL" CITATION WAS 1.6%. IN THE SAMPLE REPORTS "INTRA-ORGANIZATIONAL" CITATION WAS MUCH GREATER, 14.8%.

IN ORDER TO OBSERVE THE EFFECTS OF "SAME-AUTHOR" CITATION, JOURNAL TITLE SELF-CITATION, AND "INTRA-ORGANIZATIONAL" CITATION ON THE "SAME-CHANNEL" TENDENCY OF REPORTS AND JOURNAL ARTICLES, THE DATA FROM THIS STUDY WAS ADJUSTED FOR THESE THREE FACTORS.

Type of Publication Cited	Distribution of Citations in Journal Articles				Distribution of Citations in Reports		
	Tot.	Adjusted			Tot.	Adjusted	
		Aut.	Jrn.	Org.		Aut.	Org.
	%	%	%	%	%	%	%
Journal Articles	47	37	33	-	22	20	-
Reports	23	22	-	21	38	34	23

Citation of Journal Articles and Reports
Adjusted for Three Kinds of Self-citation

Table 7

TABLE 7 SHOWS THAT, IF AUTHORS DID NOT CITE THEMSELVES, THE SAME JOURNAL TITLE IN WHICH THEY PUBLISH, OR THE PEOPLE NEAR WHOM THEY WORK, THE "SAME CHANNEL" TENDENCY WOULD BE REDUCED IN THE SAMPLES STUDIED. IN JOURNALS, JOURNAL TITLE SELF-CITATION SEEMS TO HAVE THE GREATEST EFFECT; IN REPORTS, "INTRA-ORGANIZATIONAL" CITATION APPEARS TO BE STRONGEST. BECAUSE OF THE ALPHA RISK IN ADJUSTING DATA AFTER THE FACT, ONLY UNADJUSTED DATA WERE USED FOR TESTING THE STUDY'S HYPOTHESES.

JOURNAL ARTICLES AND REPORTS HAVE VERY SIMILAR CITING AGE PATTERNS, AS IF TIME LAG IN PUBLISHING JOURNAL ARTICLES AND REPORTS IS NOT VERY DIFFERENT. FIGURE 4 SHOWS THAT THE AGE OF CITATIONS IN JOURNALS AND REPORTS IS ESSENTIALLY THE SAME. THIS IS SURPRISING BECAUSE IT IS

USUALLY ASSUMED THAT REPORTS ARE PUBLISHED MORE RAPIDLY THAN JOURNAL ARTICLES. ALMOST ONE-THIRD OF THE MATERIAL CITED IS NO MORE THAN A YEAR OLD (PLUS OR MINUS 6 MONTHS); FIFTY-PERCENT IS LESS THAN TWO YEARS OLD; AND 80% LESS THAN 5 YEARS. IN CITATION STUDIES TWO COMMON PARAMETERS ARE USED TO CHARACTERIZE THE AGE OF A LITERATURE, MEDIAN AGE OR "HALF-LIFE" (HALF THE CITATIONS ARE YOUNGER THAN THE "HALF-LIFE" OF A GROUP OF CITATIONS), AND CUMULATIVE PERCENTAGE CITATION AT 5 YEARS, 10 YEARS, ETC. WITH A "HALF-LIFE" OF LESS THAN TWO YEARS AND A CUMULATIVE CITATION OF ALMOST 80% AT 5 YEARS, INFORMATION SCIENCE AS DEFINED IN THIS STUDY IS ONE OF THE YOUNGEST LITERATURES REPORTED.[8,14,18,21,22,23,24,25] THIS IS AN EXPECTED ATTRIBUTE OF AN EMERGING, RAPIDLY-CHANGING FIELD.

FIGURES 5 AND 6 SEPARATE CITING PATTERNS ACCORDING TO TYPE OF PUBLICATION; IN GENERAL, THE DATA REFLECT THE INFORMATION CONTINUUM, ALTHOUGH TIME BETWEEN STAGES IS NOT VERY LARGE. NOT SURPRISINGLY, BOOKS ARE THE OLDEST PUBLICATION FORM CITED BY BOTH JOURNAL ARTICLES AND REPORTS. THE UNCONVENTIONAL SHAPE OF THE PROCEEDINGS CURVE WAS POSTULATED EARLIER TO BE DUE TO THE OUTSTANDING CONFERENCE OF THE FIELD, ICSI, IN 1958. OTHERWISE, FOR REPORT-GENERATED CITATIONS, THE AGES OF JOURNAL ARTICLES, REPORTS, AND PROCEEDINGS ARE ESSENTIALLY THE SAME. THIS IS A DIFFERENT RESULT FROM VROOMAN'S[17] STUDY OF METALLURGICAL REPORT CITATIONS; IN HIS FIELD THE REPORT CITATIONS WERE CONSIDERABLY YOUNGER THAN THE JOURNAL ARTICLE CITATIONS.

THE AGE CURVES FOR THE JOURNAL ARTICLE CITATIONS (FIGURE 5) REVEAL SOME DIFFERENCE, MOSTLY SLIGHT, FROM THE REPORT CURVES (FIGURE 6). IT IS DIFFICULT TO UNDERSTAND WHY THE "PROCEEDINGS" CURVE DOES NOT SHOW AN EFFECT FROM ICSI FOR BOTH. IT WOULD SEEM FROM FIGURE 5 THAT FOR JOURNAL

AUTHORS REPORTS REACH OBSOLESCENCE MORE QUICKLY THAN DO JOURNAL ARTICLES.

CONCLUSION

THE HYPOTHESES THAT NO DIFFERENCE EXISTS BETWEEN CITATION PATTERNS IN JOURNAL ARTICLES AND REPORTS WAS NOT SUPPORTED. BOTH TYPES OF PUBLICATION SHOW A STRONG "SAME-CHANNEL" TENDENCY.

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APPENDICES

APPENDIX A

CHAPTER BY CHAPTER BREAKDOWN OF THE NUMBER OF JOURNAL ARTICLES AND REPORTS CITED IN THE ANNUAL REVIEW OF INFORMATION SCIENCE AND TECHNOLOGY, 1967

Chapter	Tot. Ref.	J.A. in Sample	Reports in Sample
1. Information Needs and Uses in Science and Technology	38	4	1
2. Design of Information Systems and Services	64	1	9
3. Evaluation of Information Systems and Services	52	3	3
4. Content Analysis, Specification and Control	146	6	13
5. File Organization and Data Management	135	3	15
6. Automated Language Processing	121	5	13
7. Hardware Developments and Product Announcements	154	4	2
8. Man-Machine Communication and Problem-Solving	109	5	3
9. Automation in Libraries and Information Centers	83	2	1
10. Handling Chemical Compounds and Information Systems	179	11	3
11. Applications in Medicine	147	14	2
12. Techniques for Publication and Distribution of Information	212	7	1
13. National Information Issues and Trends	90	3	2
14. Professional Aspects	64	2	2
	1594	70	70

APPENDIX B

LIST OF JOURNAL ARTICLES INCLUDED IN THE SAMPLE FOR THIS STUDY

1. Artandi, Susan. The Searchers - Links Between Inquirers and Indexes. Spec. Libr. 57: 571-574, Oct. 1966.

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Note: The discovery was made when the thesis was near completion that three of the journal articles appear twice in the sample (Nos. 6 & 59, 10 & 44, 43 & 67). It was felt that this would not affect the results significantly, and so no changes were made in the sample to correct for this duplication.

APPENDIX C

LIST OF REPORTS INCLUDED IN THE SAMPLE FOR THIS STUDY

1. Anderson, Ruth, Ethel Marden, and Beatrice Marron. File Organization for a Large Chemical Information System. Final Report, May 1964-Dec. 1965. Center for Computer Sciences and Technology, National Bureau of Standards, Washington, D. C., 19 Nov. 1965, 26p. (AD 633 354)

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57. Baker, et al. Advanced Computer Organization. Final Report. 5 Nov. 1964 - 4 Jan. 1966. IBM Federal Systems Div., Bethesda, Md., May 1966, 302p. (RADC TR-66-148) (AD 484 444)

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60. Levien, Roger E., and M. E. Maron. A Computer System for Inference Execution and Data Retrieval. RAND Corp., Santa Monica, Calif., Sept. 1966, 32p. (RM-5085-PR) (AD 622 570)

61. Glasersfeld, Ernst von, et al. Automatic English Sentence Analysis. Final Scientific Report for 1 Mar. 1964 - 30 June 1965. Language Research Section, Instituto Documentazione della Associazione Meccanica Italiana (IDAMI) Milan, Italy, 30 June 1965, 113p. (Report No. ILRS-T-11, 65063) (AFOSR 65-1908) (AD 622 570)

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APPENDIX D

LIST OF INSTITUTIONS WHICH ISSUE THE MAJORITY OF INFORMATION SCIENCE REPORTS *

INSTITUTIONS	CITATIONS	TOTAL NO. OF INSTITUT.
BUSINESS		61
IBM	108	
SYSTEM DEVELOPMENT CORPORATION	86	
RAND CORPORATION	23	
DOCUMENTATION INC.	21	
GENERAL ELECTRIC CO.	17	
MITRE CORPORATION	13	
GOODYEAR AIRCRAFT CORPORATION	12	
AUERBACH CORPORATION	9	
UNIVAC CORPORATION	9	
ARTHUR D. LITTLE, INC.	8	
THOMPSON RAMO WOOLDRIDGE INC.	8	
HERNER AND COMPANY	7	
CONTROL DATA CORPORATION	5	
HUGHES AIRCRAFT CO.	5	
COMPUTER COMMAND AND CONTROL CO.	5	
BOLT, BERANEK AND NEWMAN, INC.	5	
ZATOR COMPANY	5	
WESTAT RESEARCH ANALYSTS, INC.	5	
PRIVATE INSTITUTIONS AND ASSOCIATIONS		57
ASLIB CRANFIELD RESEARCH PROJECT	19	
AMERICAN PSYCHOLOGICAL ASSOCIATION	16	
COUNCIL ON LIBRARY RESOURCES	10	
NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL	10	
AMERICAN INSTITUTE OF PHYSICS	7	
INTERNATIONAL FEDERATION FOR DOCUMENTATION	6	
AMERICAN STANDARDS ASSOCIATION	6	
UNESCO	6	
AMERICAN COLLEGE AND RESEARCH LIBRARIES	5	
UNIVERSITIES		45
UNIVERSITY OF ILLINOIS	39	
MIT	37	

*ONLY THE INSTITUTIONS IN THE SAMPLE WHICH WERE CITED MORE THAN FIVE TIMES, WERE LISTED.

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